

Abstract

Project STEP. The objective of the National Science Foundation-funded Science and Technology Enhancement Program (STEP) is to provide training within the field of secondary education to engineering and science graduate students with the goal that the fellows will continue to bring their expertise to high school classrooms throughout their careers. This is facilitated through a year-long collaboration of the graduate fellow and a team of four teachers within a given high school.

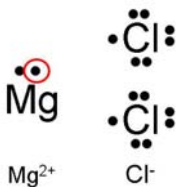
Fellow responsibilities. As a fellow, I am to design lessons pertaining to a topic within the established curriculum, placing the content within the context of engineering, my personal research, and Cincinnati, demonstrating to the students that their current studies are applicable to their daily lives.

The lesson. Teachers within a variety of subjects at different levels agree that the concept of ionic and covalent bonding is difficult for students. In this lesson, students examined a City of Norwood water report and product labels to identify elements that are present in their drinking water, personal hygiene products, and food to understand that elements and bonding are present in their everyday lives. Groups of students then designed and built models illustrating the differences between ionic and covalent bonding. Group models varied from group to group based on individual design.

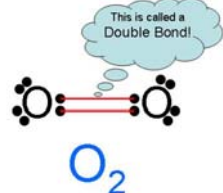
Assessment. Analysis of the identical pre- and post- activity quiz given to two classes indicated that content knowledge increased by an average of 9% in Class one and 20% in Class two. Individual results categorized by class and student can be found in the results section.

Introduction

Ionic bonding



Covalent bonding



Problem: Students having a difficult time remembering the difference between ionic and covalent bonding.

The lesson: Students used the materials supplied to design and construct models of ionic and covalent bonding.

Activity

Gaining attention:

- Students identified elements in a Norwood City water report

Water Quality Data					
Regulated Contaminants Subject to an MCL, Action Level (AL) or Treatment Technique (TT)					
Contaminant (unit)	MCL or AL (if M)	TT (if T)	Significant Exceedance	Range of Exceedance	Special source of contamination
Total Coliform Bacteria	500	1,000	0	0	None
Lead	0.01	0.01	0	0	None
Copper	1.3	1.3	0	0	None
Chlorine Residual	4.0	4.0	0	0	None
Free Chlorine Residual	2.0	2.0	0	0	None
Total Hardness	175	175	0	0	None
Calcium Hardness	75	75	0	0	None
Magnesium Hardness	100	100	0	0	None
Total Dissolved Solids	500	500	0	0	None
Total Suspended Solids	30	30	0	0	None
Iron	0.3	0.3	0	0	None
Manganese	0.05	0.05	0	0	None
Nitrate-Nitrogen	10	10	0	0	None
Nitrite-Nitrogen	1.0	1.0	0	0	None
Ammonia-Nitrogen	1.0	1.0	0	0	None
Phosphate	0.1	0.1	0	0	None
Fluoride	4.0	4.0	0	0	None
Chloride	250	250	0	0	None
Sulfate	250	250	0	0	None
Total Chloride and Sulfate	500	500	0	0	None
Chloride	250	250	0	0	None
Sulfate	250	250	0	0	None
Calcium	75	75	0	0	None
Magnesium	100	100	0	0	None
Total Hardness	175	175	0	0	None
Calcium Hardness	75	75	0	0	None
Magnesium Hardness	100	100	0	0	None
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